

Product Summary

| $V_{(BR)DSS}$ | $R_{DS(ON) \max}$ | $I_D \max$ $T_A = +25^\circ\text{C}$ |
|---------------|--|---|
| -30V | 13m Ω @ $V_{GS} = -10\text{V}$ | -9.8A |
| | 25m Ω @ $V_{GS} = -4.5\text{V}$ | -7.0A |

Description

This MOSFET has been designed to minimize the on-state resistance ($R_{DS(ON)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

Applications

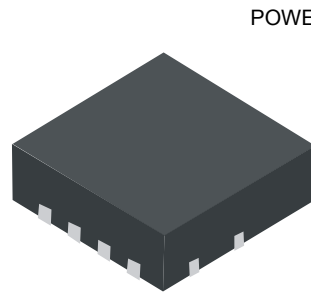
- Backlighting
- Power Management Functions
- DC-DC Converters

Features and Benefits

- Low $R_{DS(ON)}$ – ensures on state losses are minimized
- Small form factor thermally efficient package enables higher density end products
- Occupies just 33% of the board area occupied by SO-8 enabling smaller end product
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

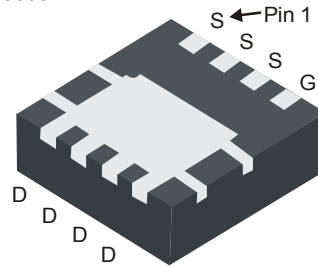
Mechanical Data

- Case: POWERDI3333
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections Indicator: See diagram
- Terminals: Finish — Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208 $\text{\textcircled{E3}}$
- Weight: 0.0174 grams (approximate)

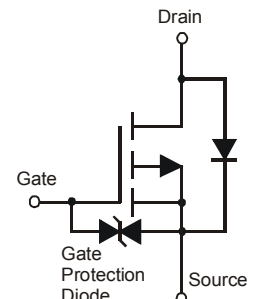


Top View

POWERDI3333



Bottom View



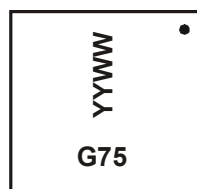
Equivalent Circuit

Ordering Information (Note 4)

| Part Number | Case | Packaging |
|---------------|-------------|------------------|
| DMG7401SFG-7 | POWERDI3333 | 2000/Tape & Reel |
| DMG7401SFG-13 | POWERDI3333 | 3000/Tape & Reel |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



G75 = Product marking code
 YYWW = Date code marking
 YY = Last digit of year (ex: 10 for 2010)
 WW = Week code (01 – 53)

Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Units | |
|--|------------------|--|--|----------------|
| Drain-Source Voltage | V _{DSS} | -30 | V | |
| Gate-Source Voltage | V _{GSS} | ±25 | V | |
| Continuous Drain Current (Note 6) V _{GS} = -10V | I _D | T _A = +25°C T _A = +70°C | -9.8 -7.7 | A |
| | | t < 10s | T _A = +25°C T _A = +70°C | -13.5 -10.8 |
| Maximum Continuous Body Diode Forward Current (Note 5) | I _S | -3.0 | A | |
| Pulsed Drain Current (10µs pulse, duty cycle = 1%) | I _{DM} | -80 | A | |
| Avalanche Current (Notes 7 & 8) | I _{AR} | 14 | A | |
| Repetitive Avalanche Energy (Notes 7 & 8) L = 1mH | E _{AR} | 104 | mJ | |

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Units | |
|--|-----------------------------------|------------------------|-------|------|
| Total Power Dissipation (Note 5) | P _D | T _A = +25°C | 0.94 | W |
| | | T _A = +70°C | 0.6 | |
| Thermal Resistance, Junction to Ambient (Note 5) | R _{θJA} | Steady State | 137 | °C/W |
| | | t < 10s | 82 | °C/W |
| Total Power Dissipation (Note 6) | P _D | T _A = +25°C | 2.2 | W |
| | | T _A = +70°C | 1.3 | |
| Thermal Resistance, Junction to Ambient (Note 6) | R _{θJA} | Steady State | 60 | °C/W |
| | | t < 10s | 36 | °C/W |
| Thermal Resistance, Junction to Case (Note 6) | R _{θJC} | 3.0 | °C/W | |
| Operating and Storage Temperature Range | T _J , T _{STG} | -55 to +150 | °C | |

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|--|---------------------|------|------|------|------|---|
| OFF CHARACTERISTICS (Note 8) | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | -30 | — | — | V | V _{GS} = 0V, I _D = -250µA |
| Zero Gate Voltage Drain Current | I _{DSS} | — | — | -1 | µA | V _{DS} = -30V, V _{GS} = 0V |
| Gate-Source Leakage | I _{GSS} | — | — | ±10 | µA | V _{GS} = ±20V, V _{DS} = 0V |
| ON CHARACTERISTICS (Note 8) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | -1.7 | — | -3.0 | V | V _{DS} = V _{GS} , I _D = -250µA |
| Static Drain-Source On-Resistance | R _{DS(on)} | — | 9 | 11 | mΩ | V _{GS} = -20V, I _D = -12A |
| | | — | 10 | 13 | | V _{GS} = -10V, I _D = -9A |
| | | — | 17 | 25 | | V _{GS} = -4.5V, I _D = -5A |
| | | — | — | — | | V _{DS} = -5V, I _D = -10A |
| Forward Transfer Admittance | Y _{fs} | — | 21 | — | S | V _{DS} = -5V, I _D = -10A |
| DYNAMIC CHARACTERISTICS (Note 9) | | | | | | |
| Input Capacitance | C _{iss} | — | 2246 | 2987 | pF | V _{DS} = -15V, V _{GS} = 0V, f = 1.0MHz |
| Output Capacitance | C _{oss} | — | 352 | 468 | pF | |
| Reverse Transfer Capacitance | C _{rss} | — | 294 | 391 | pF | |
| Gate resistance | R _g | — | 5.1 | 10 | Ω | V _{DS} = 0V, V _{GS} = 0V, f = 1.0MHz |
| Total Gate Charge (V _{GS} = 4.5V) | Q _g | — | 20.5 | 30 | nC | V _{DS} = -15V, I _D = -12A |
| Total Gate Charge (V _{GS} = 10V) | Q _g | — | 41 | 58 | nC | |
| Gate-Source Charge | Q _{gs} | — | 7.6 | - | nC | |
| Gate-Drain Charge | Q _{gd} | — | 8.0 | - | nC | |
| Turn-On Delay Time | t _{D(on)} | — | 11.3 | 23 | ns | V _{DD} = -15V, V _{GS} = -10V, R _L = 1.25Ω, R _G = 3Ω, |
| Turn-On Rise Time | t _r | — | 15.4 | 31 | ns | |
| Turn-Off Delay Time | t _{D(off)} | — | 38.0 | 61 | ns | |
| Turn-Off Fall Time | t _f | — | 22.0 | 38 | ns | |
| BODY DIODE CHARACTERISTICS | | | | | | |
| Diode Forward Voltage | V _{SD} | — | -0.7 | -1.0 | V | V _{GS} = 0V, I _S = -1A |
| Reverse Recovery Time (Note 9) | t _{rr} | — | 20 | 31 | ns | I _S = -9.5A, dI/dt = 100A/µs |
| Reverse Recovery Charge (Note 9) | Q _{rr} | — | 9.5 | 18 | nC | |

- Notes:
- Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 - Device mounted on FR-4 substrate PC board, 2oz copper, with 1inch square copper plate.
 - I_{AR} and E_{AR} rating are based on low frequency and duty cycles to keep T_J = +25°C.
 - Short duration pulse test used to minimize self-heating effect
 - Guaranteed by design. Not subject to product testing

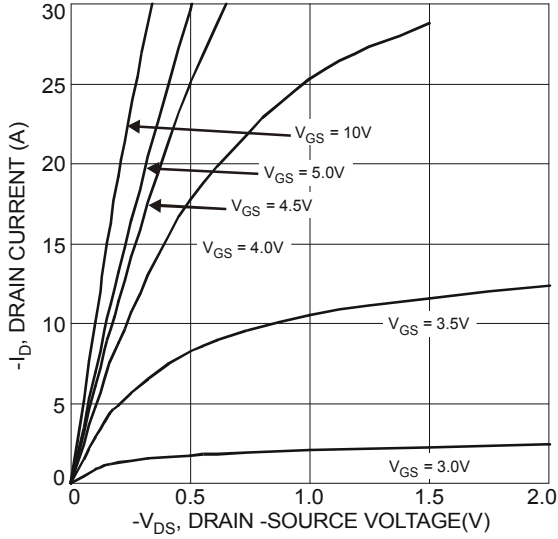


Fig. 1 Typical Output Characteristics

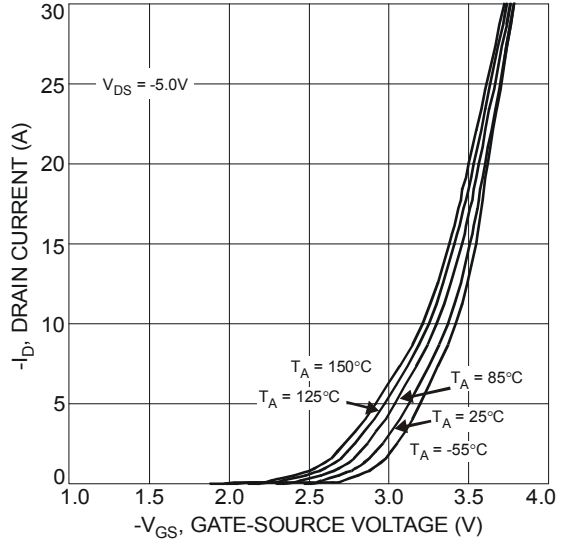


Fig. 2 Typical Transfer Characteristics

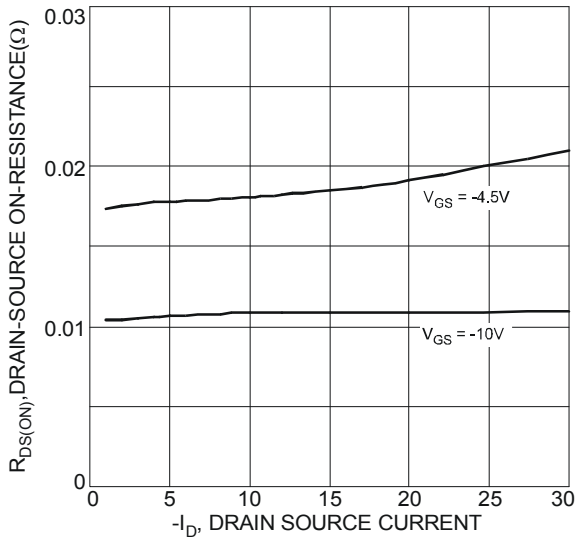


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

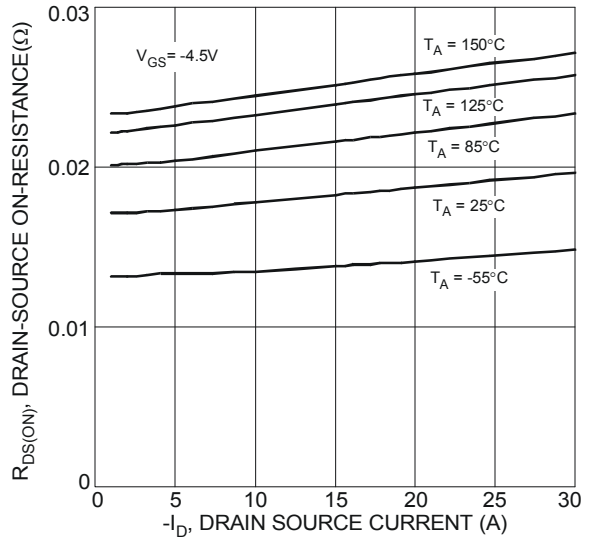


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

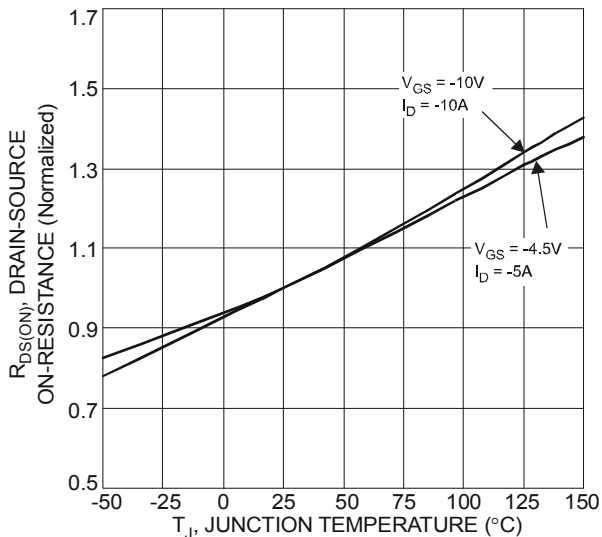


Fig. 5 On-Resistance Variation with Temperature

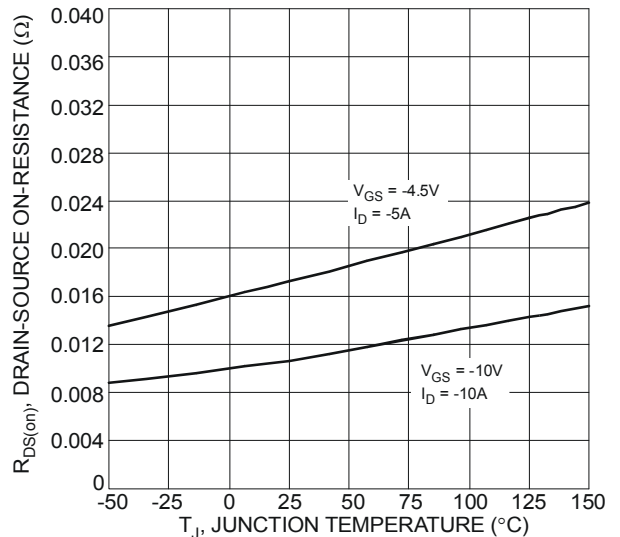


Fig. 6 On-Resistance Variation with Temperature

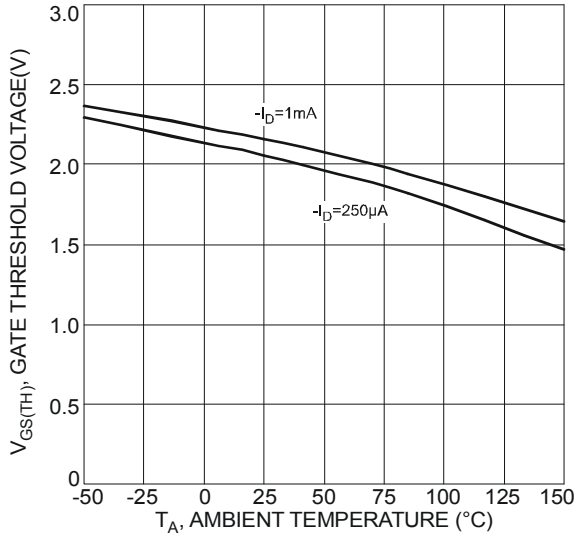


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

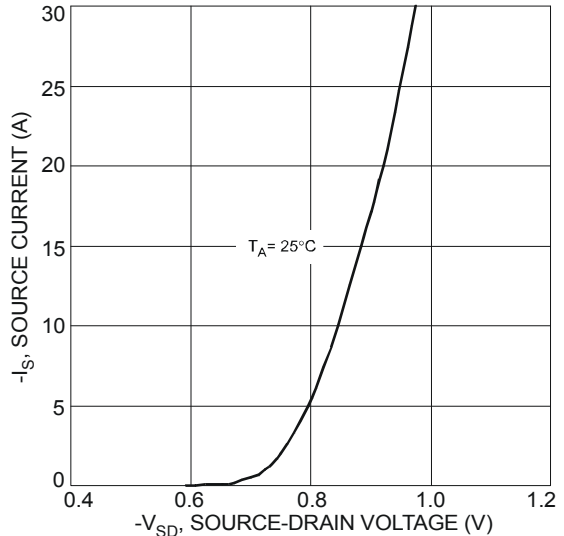


Fig. 8 Diode Forward Voltage vs. Current

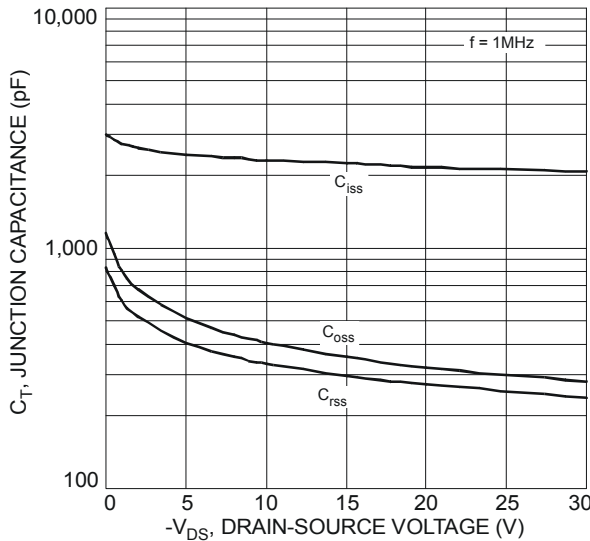


Fig. 9 Typical Junction Capacitance

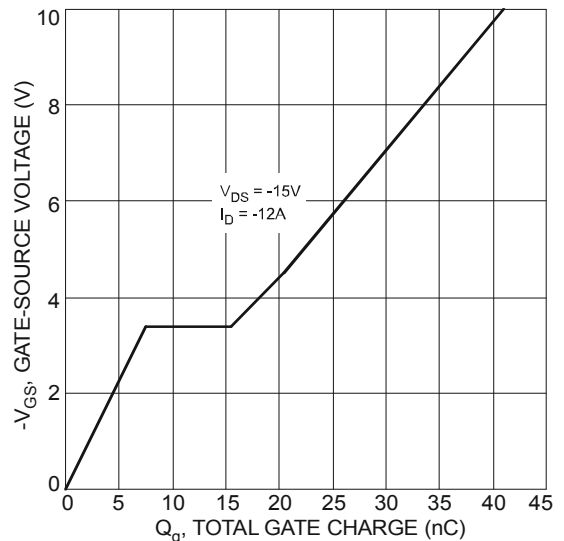


Fig. 10 Gate-Charge Characteristics

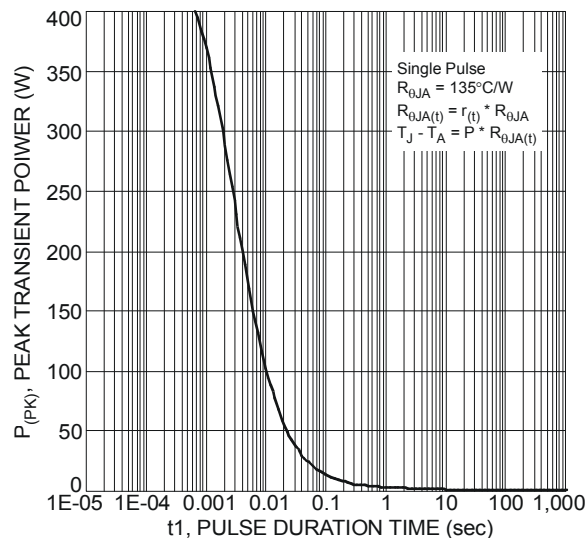


Fig. 11 Single Pulse Maximum Power Dissipation

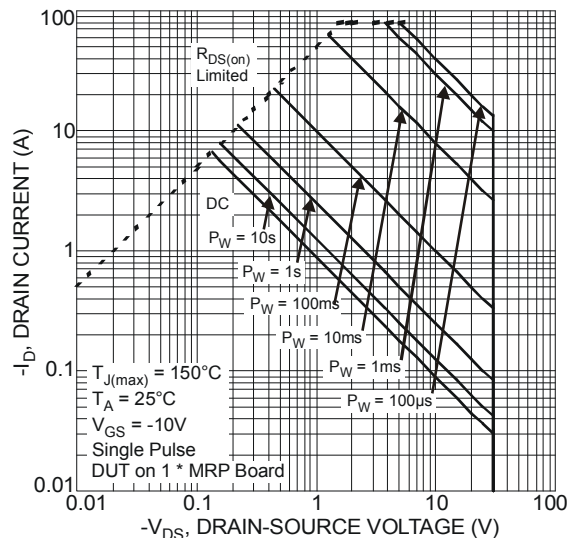
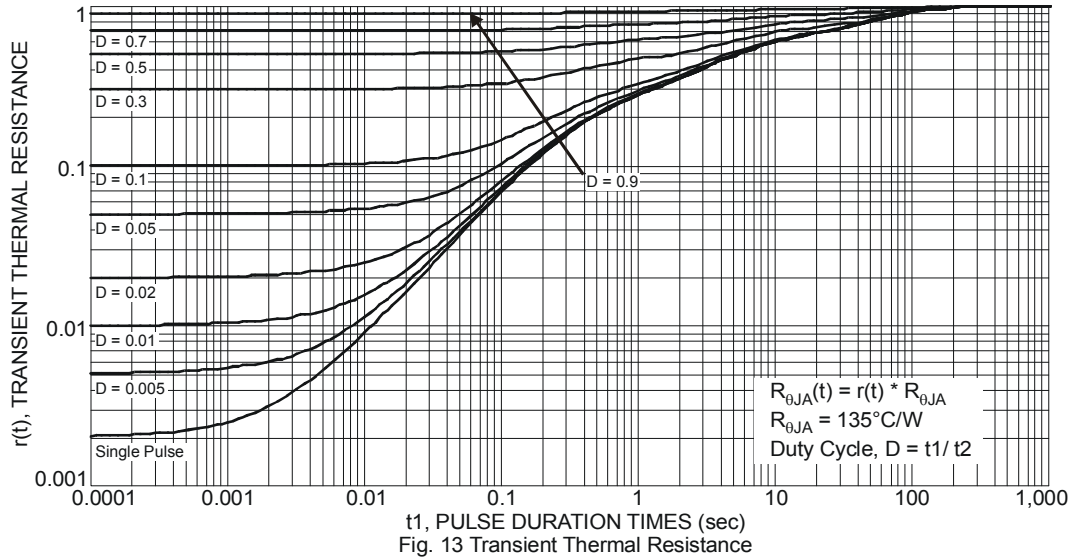
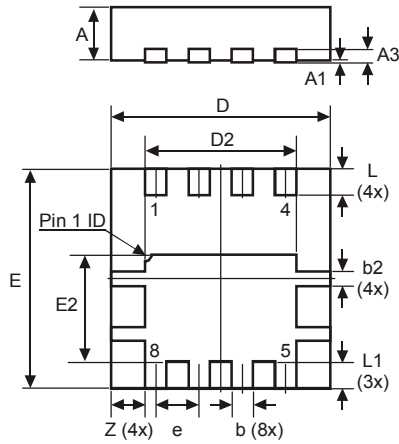


Fig. 12 SOA, Safe Operation Area



Package Outline Dimensions

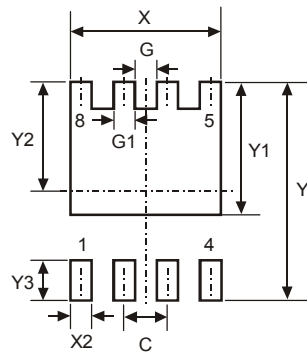
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| POWERDI3333-8 | | | |
|----------------------|------|------|-------|
| Dim | Min | Max | Typ |
| D | 3.25 | 3.35 | 3.30 |
| E | 3.25 | 3.35 | 3.30 |
| D2 | 2.22 | 2.32 | 2.27 |
| E2 | 1.56 | 1.66 | 1.61 |
| A | 0.75 | 0.85 | 0.80 |
| A1 | 0 | 0.05 | 0.02 |
| A3 | - | - | 0.203 |
| b | 0.27 | 0.37 | 0.32 |
| b2 | - | - | 0.20 |
| L | 0.35 | 0.45 | 0.40 |
| L1 | - | - | 0.39 |
| e | - | - | 0.65 |
| Z | - | - | 0.515 |
| All Dimensions in mm | | | |

Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 0.650 |
| G | 0.230 |
| G1 | 0.420 |
| Y | 3.700 |
| Y1 | 2.250 |
| Y2 | 1.850 |
| Y3 | 0.700 |
| X | 2.370 |
| X2 | 0.420 |

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